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METHOD FOR THE RETRIEVAL OF INFORMATION FROM DATABASES AND SYSTEM FOR CARRYING OUT THE SAID METHOD

The invention is related to a method in accordance with the generic term of the independent claim. The method serves for the retrieval of information from at least one database. Furthermore, the invention relates to a system for carrying out the method in accordance with the generic term of the corresponding, independent claim.

- 5 Serving as sources for topical information are, for example radio, television, teletext, newspapers, geographical maps and plans as well as lists of all kinds, from which an information gatherer should the occasion arise searches for and chooses topical information so-to-say by hand. From databases, to which access is possible with electronic means, therefore, for example from CDs or also from the internet and intranet,
- 10 information can be retrieved significantly more specifically with the help of search engines. In doing so, however, as a result of the abundance of the information and due to the formulation of the criteria, according to which a search machine is to operate, new problems are created, which in many instances discourage the information collector or even overtax him or her.
- 15 The invention now sets itself the objective of creating a method, in which the retrieval of information from databases is automatically controlled. Furthermore, the invention sets itself the objective of creating a system for carrying out the method.

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This objective is achieved by the method and by the system, as they are defined in the claims.

In the method in accordance with the invention, the information is requested from a location, in particular from a variable location and the search engine utilized is controlled on the basis of criteria, which relate to this location. In other words, the search engine restricts itself to such information, which is associated with the location of the information request. Further control of the search engine by the user is conceivable, not, however a prerequisite. The system according to the invention comprises user terminals for the information retrieval and for the receiving of information, in particular mobile user terminals, means for the storage and updating of at least one database and for searching for requested information in the database, as well as a communication network for the transmission of the information request and of the requested information between the database and the user terminal. At least the mobile user terminals are equipped to be able to determine their respective current location and the at least one database is equipped for being searched on the basis of location criteria.

The method in accordance with the invention is based on a combination of a data or message transmission system with at least one database managed by a computer with a search engine. The transmission system comprises a communication network and a multitude of in particular mobile user terminals, which co-operate with the communication network. The transmission system can also comprise stationary user terminals. The installations of the communication network, in particular its transmission stations (base stations), are substantially stationary. For the purpose of a controlled searching in the at least one database, a mobile user terminal determines its current location in the communication network and transmits this to the program, by means of which information is sought in the database. Stationary user terminals advantageously retrieve corresponding location information from a memory storage device.

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The at least one database contains information, which are characterized with location attributes in such a manner, that with the help of the search engine they can be selected and/or organized (sorted) in dependence of the location.

- 5 The user terminals are equipped for the requesting of information from the at least one database and for the receiving of the information. This means that, in addition to means for the transmission and receiving of information, they also comprise means for entering the request and means for displaying the requested information, for example, keyboard and display screen, as is known from the „Communicator“ device of the Nokia company.
- 10 An information request is transmitted to the computer managing the database from the user terminal through the communication network together with location data concerning the user terminal. As a result, this computer is initiated to select and/or organize information on the basis of the location data and to transmit the selected and/or organized information to the user terminal.
- 15 A mobile user terminal determines its current location by contacting at least one reachable transmitting station of the network with the object of receiving information about its location or about its identity. Advantageously, during such contact characteristics of the data transmission are recorded also and are made use of for the determination of the location. The data elicited from the contact, which characterize the
- 20 location of the user terminal are transmitted, for example, through a service channel to the database selected by the user. In such instances, for example, in which the establishing of a contact with transmitting stations is not possible or else would provide too inaccurate location characteristics, it is of advantage to equip the user terminal in such a manner, that the user can enter location attributes into it or can specify them
- 25 more precisely by means of a manual entry.

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The data necessary for the determination of the location being location data and if so required also characteristics of transmitting stations of the communication network, are e.g. stored in the transmitting stations and can be transmitted to a user terminal every time a contact is established.

- 5 On the other hand, when establishing the contact also only the identity of transmitting stations can be transmitted. The user terminal then retrieves the data necessary for the determination of the location from a corresponding memory device on the basis of the identity transmitted. For this, for example, a proprietary terminal memory device can be provided for permanently storing locations and if so required further characteristics of transmitting stations of the whole communication network.
- 10 The same data can also be stored on a card interchangeably located in the user terminal, to which a provider has access for the purpose of updating the data. An updating of this kind can be carried out during system idle times. Because for an extensive network and for accurate indications such memory device has to be very large and
- 15 also has to be updated time and again, it is more advantageous to store and to update the corresponding data in a memory device accessible through the communication network and to make it available essentially continuously to the user terminal in dependence of its current location, for example, via a service channel.

- 20 The simplest method for the determination of the location consists in assigning the user terminal to that transmitting station, which is situated closest to its location and to define its location as within the coverage area of this transmitting station. In a mobile telephone network of today, coverage areas of this kind have a diameter of approximately 100 m up to 10 km, which - depending on the requested information - may already be sufficient for a corresponding selection or organization of the information.
- 25 The location of the user terminal in this case corresponds to the coverage area of the transmitting station and as such it can be directly taken over from the data of the communication network. In order to enhance the accuracy, the coverage areas

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can be experimentally established, in order that they already include corrections for signal reflections, etc.

If the user terminal is able to make contact with two or more than two stationary transmitting stations, then the location of the user terminal can be significantly more accurately determined in substantially the same manner, it being a location within the overlap area of the coverage areas of the transmitting stations. Data, which characterize an overlap area of this kind, either (like the coverage areas of the individual transmitting stations) can be made available by the communication network or else can be determined in the user terminal with the help of a corresponding algorithm starting from the data regarding the coverage areas of the transmitting stations, with which the user terminal is able to make contact.

More accurate indications about the location of the user terminal can be determined, if not solely the coverage areas of transmitting stations are evaluated, but also the duration of the signal transmission (signal transmit times) between the user terminal and the transmitting station is recorded and included in the determination of the location. With the inclusion of a distance measurement through the signal transmit time, the location is in essence recorded as being on a circular curve or on the arc of a circle around a transmitting station. In the case of contact with two transmitting stations, it is recorded as the intersecting points of two circular curves or of two arcs of a circle.

If the user terminal is in a position to make contact with three or more than three transmitting stations of a mobile telephone network of today, then with the recording of the signal transmit time and with the help of an appropriate calculation algorithm, the location of a user terminal can be determined to within an accuracy of approx. 30 m.

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As in the case of all triangulatory determination, the accuracy of the determination of the location becomes greater, the more transmitting stations are able to be included in the determination. It also becomes manifest, that the achievable accuracy increases, if for the determination of the location, stations with greater and smaller distances from the location to be determined are combined (as differing as possible distances). In addition, it is an advantage, if these stations are situated in as different as possible directions from the location to be determined. Therefore it is advantageous, to equip the algorithm utilized for the determination of the location in such a manner, that in such cases, in which the user terminal is in a position to contact a multitude of transmitting stations, it selects such transmitting stations for determining the location, which have as different as possible directions and distances from the location to be determined.

In the same manner as the signal transmit time between the user terminal and the transmitting station, it is possible also to record and utilize in the algorithm for determining the location, the intensity of the transmission, which also characterizes the distance between the user terminal and the transmitting station, and/or the radio bearing angle.

The accuracy of the determination of the location is also dependent on the accuracy of the data, which characterize the location of the transmitting stations. It is an advantage to not solely limit these data to geographical co-ordinates, but to also include transmission characteristics, such as, for example, signal reflections.

It is known to determine within the receiver section of a mobile telephone, whether a connection with a transmitting station is a direct one or if it is based on a reflected connection (echo) with a longer signal transmit time, and to use the result of this determination for the improvement of the reception. Information of this kind can also

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be taken into consideration for improving the accuracy of the determination of the location, in that it is polled by the receiver section of the user terminal and in a corresponding algorithm is processed together with other data. Depending on the constellation of the aerial, from such location determination with an accuracy of down to 20
5 to 30 m can result.

In particular for cases, in which data available from the communication network for the determination of the location (locations and coverage areas of transmitting stations) do not allow a satisfactory precision, it is of advantage to extend the algorithm for the determination of the location with a memory for already determined locations
10 together with the corresponding time and to expand it in such a manner, that for a moving user terminal previously determined locations and movement vectors elicited from them are included in the determination of the location, this at least for the verification of the plausibility of a newly determined location.

By the inclusion of established movement vectors for a moving user terminal, it also
15 becomes possible to design the control of the search engine even more specifically. By matching the search engine function with the direction and the speed of the moving user terminal, the search can be restricted to such information, which relates to localities, which are geographically in front of (ahead of) the user terminal. Through the comparison of movement vectors with geographical information (e.g.,
20 the routes of motorways or railway lines), the search can also be restricted to correspondingly interesting information (e.g., for car drivers or travellers in railway trains).

For the further specific alignment of the search function it is also advantageous to store in memory additional values from experience with respect to search criteria

established by the respective user, in particular data from previous information requests, etc.

5 An algorithm for the location determination on the basis of acquired and recorded data is advantageously installed in the user terminal. This algorithm generates data, which characterize the location and which, for example, through a service channel are transmitted to the computer managing the database and which advantageously are directly able to be utilized by the search engine as search criteria.

10 The transmission system, for example, is a UMTS - mobile telecommunication network (Universal Mobile Telecommunications System) or else a GSM - telecommunication network with corresponding mobile user terminals. In the publication WO-93/12590, a method is described, with which from the signal transmit time and complex weightings the position of a mobile user terminal is determinable within a network cell. The publication DE-19524927 concerns itself with the object guidance within a UMTS - network, which also works with the location of a network participant. Both of the publications mentioned therefore are in a position to provide methods for the determination of the location for a mobile user terminal in a communication network, which determination of the location can be utilized as a component part of the method in accordance with the invention. It is also known, how to evaluate echo effects and with this to correct distances for reflection effects, which have been
15 determined from signal transmit times. As a result, determination of locations based on recorded signal transmit times can be improved.
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25 The communication between a user (via the user terminal) and the computer managing the database, resp., the search engine, can be automated, this means, designed in such a manner, that the user is automatically provided with information corresponding to his current location.

The communication between the user (via the user terminal) and the computer managing the database, resp., the search engine, can also be interactive, i.e., designed in such a manner, that the user actively requests information from a specific database and if so required is in a position to enter criteria, which the search engine is to apply
5 in addition to the location criteria. The user if so required can also file information in the database, which is then automatically complemented with a location attribute, which corresponds to the momentary location of the corresponding user terminal.

It is obviously also possible to search the database with search engine equipped for the method in accordance with the invention, in which database the information is
10 provided with location attributes, by actively entering selected such attributes. When doing so, however, it is necessary to pay attention, that the attributes are entered exactly, which may possibly lead to difficulties. Such difficulties will not arise when using the method according to the invention, i.e. when utilizing location data automatically determined in the communication system.

15 The databases and search engines, which are employed in the method according to the invention, as such do not differ from known databases and search engines and for this reason are not described here in more detail.

The information stored in the at least one database and equipped with location attributes can be of the most diverse nature, for example, it can be in the form of geographical maps, lists of hotels, parking spaces, cinemas, theatres or shops/businesses
20 or also timetables for railway trains, electric tramcars, etc.

The method in accordance with the invention is in a position to play a central role in the individual traffic and information logistics in the case of major events, in par-

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5 ticular in the case of events being staged within an extensive area. If a visitor to an event of this type carries with him a correspondingly equipped mobile user terminal, then already during the journey, in dependence of his individual approach route (railway or road), he is in a position to request information about conveniently situated, not yet occupied parking spaces or about "individual events". As a result, every person attending can help himself to information and plan his journey accordingly, therefore he or she can plan to avoid already full parking spaces, traffic jams or inconveniently located events, which are due to start in a too short time.

10 To achieve this purpose, it may well be advantageous to filter the information requested by a user not only by location, but also according to the actual time.

15 The method according to the invention can be used, for example, for leisure activities, touristic purposes or also for business applications. It creates a new market for providers of information, wherever corresponding communication networks are available. It goes without saying, that in this it is also possible to request information from databases equipped for the method according to the invention from stationary user terminals (e.g., from computers capable of connecting to the internet), the location of which is traceable, for example, from the telephone number used.

20 The mobile user terminal, which is utilized by the person requesting information, for example, just like a mobile telephone handset comprises a keyboard and a display, with the help of which the information gatherer selects the desired information from a menu-driven program and if so required is also in a position to more accurately define the location criteria (for example, by selecting a range magnitude value) and/or to indicate further search criteria. The information transmitted is then visually indicated on the display. It is, however, also possible to equip the user terminal for
25 requesting the information to operate by means of a key push or for requesting the

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information in a purely acoustic manner and then transmitting the requested information to the person requesting it in acoustic form.

It is an advantage to combine the method according to the invention with further services in such a manner, that selections made on the basis of the information transmitted can also initiate further actions, thus, for example, that tickets for chosen
5 means of transportation and traffic routes can be directly ordered or purchased, tickets for selected events can be reserved or purchased or hotel rooms in selected hotels can be booked directly.

A further example for the application of the method described in the invention is an
10 information gatherer, who wants to find out train departures from the closest railway station and would like to book a ticket for one of the departing trains. In this case it is advantageous, if the user for the access to the database of the railway operator, which e.g. contains the complete timetable, is in a position to define further search criteria (arrival time / departure time, destination) in addition to the automatically supplied
15 criterion of his location. It is also advantageous, if the information transmitted is also filtered or capable of being filtered in accordance with the actual time. The selection of a certain train and the ordering of the corresponding ticket are carried out in an as such known manner not being part of the method in accordance with the invention.

A further application example is to look at a calendar of events of a geographical
20 region, wherein the filtered information from the database is organized in such a manner, that the events are listed in a sequence of increasing distances between the location of the event and the current location of the user terminal. Further filtering according to the time is advantageous for automatically filtering out events already finished at the time of the request or events which have already started.